Origin : a 60 GHz radio-over-fiber home area network project

Camilla Kärnfelt, Michel Ney, Daniel Bourreau, Adonis Bikiny, Gaetan Guevel, Yannick Paugam, François Gallée, Joffray Guillory, Anna Pizzinat, Benoît Charbonnier, et al.

ORIGIN – a 60 GHz Radio-over-Fiber Home Area Network project

FUI8-ORIGIN (Optical-Radio Infrastructure for Gigabit/s Indoor Network)

Authors

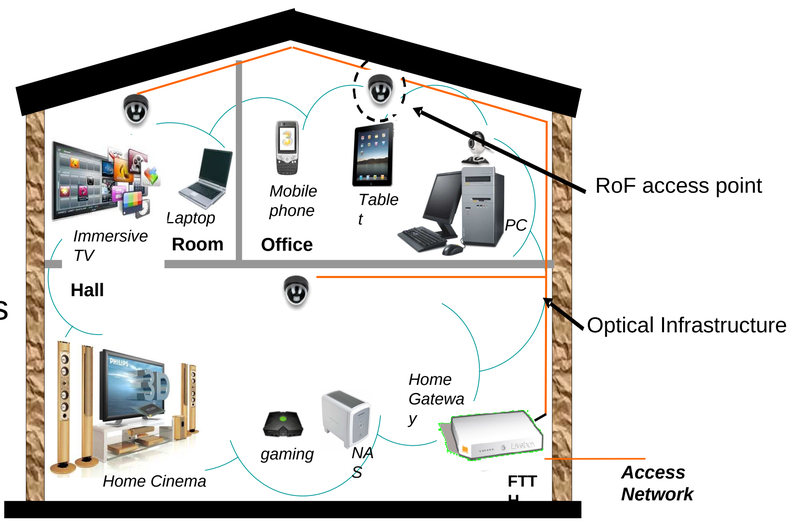
C. Kärnfelt[1], M. Ney[1],
D. Bourreau[1], A. Bikiny[1],
G. Guével[1], Y. Paugam[1],
F. Gallée[1], J. Guillory[2],
A. Pizzinat[2], B. Charbonnier[2],
S. Meyer[2], O. Bouffant[2],
G. Delas[2], H.W.Li[3],
E. Tanguy[3], M. Brunet[3],
G. Lirzin[3], A. Chousseaud[3],
C. Algani[4], A-L. Billabert[4],
J-L Polleux[4], C. Canepa[5],
G. Gougeon[6], V. Gouin[7]

Partners

1) Télécom Bretagne, Microwave department, Lab-STICC UMR CNRS 3192, Brest
2) Orange Labs, Lannion
3) IREENA, Nantes
4) ESYCOM, Paris
5) ACOME, Mortain
6) SIRADEL, Rennes
7) NIJI, Rennes

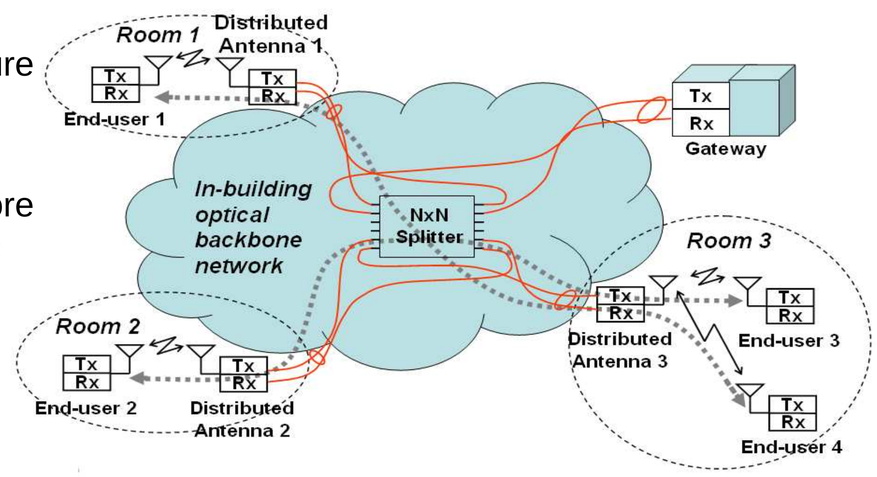
60 GHz IN THE HOME

- Multiservice and multiuser system for the future home
- Multi Gigabit/s capacity
- 60 GHz standards for wireless use are now being finalized and adopted
- 60 GHz indoor implies limited coverage (i.e. one room), need of low-loss infrastructure to dispatch signal across walls
- Multipoint-to-Multipoint (Mpt-to-Mpt) system architecture



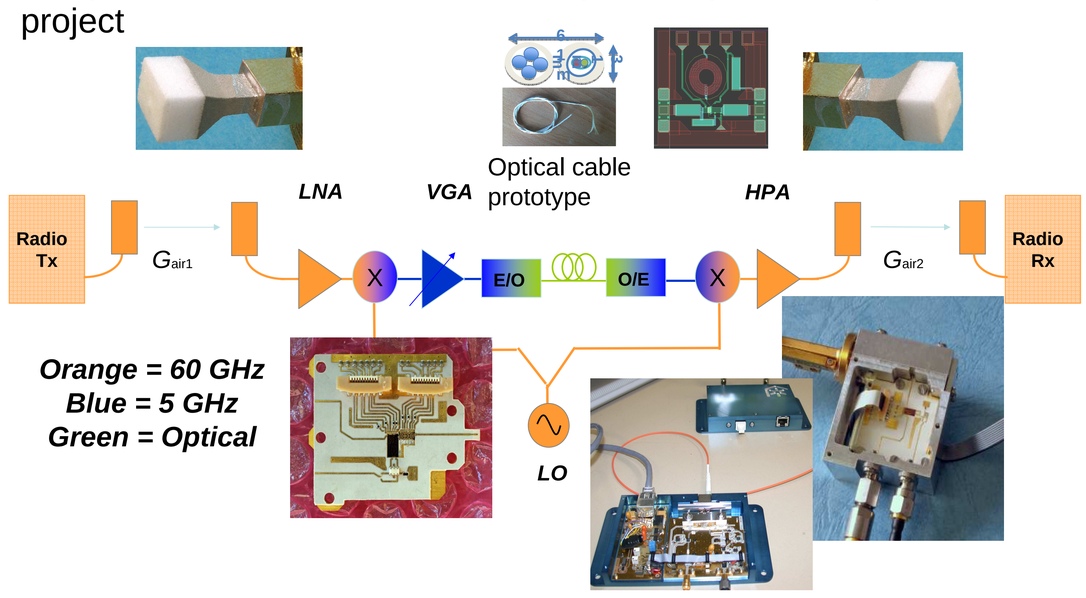
ORIGIN SYSTEM ARCHITECTURE

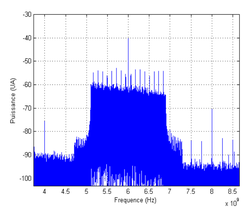
- To dispatch the signal to all rooms a low cost HAN RoF infrastructure is proposed
- The HAN RoF infrastructure is transparent to different standards
- The received 60 GHz radio signal is down-converted to 5 GHz before its transfer on optical fiber and then up-converted to 60 GHz before wireless transmission
- Reduced electromagnetic radiation and power consumption (access points only activated when needed)



HARDWARE DEVELOPMENT : 1st GENERATION

- VCSELs, photodiodes, cables, antennas, mm-wave and cm-wave TX and RX modules
- A pre-industrialized demonstrator (6 rooms) will be implemented and tested at the end of the project



Transmission result for first RoF prototype. •Protocol IEEE802.15.3c High Speed Interface mode				
Direct transmission (coaxial cable) 	RoF transmission •100 m fiber (Draka MMF OM3) • One free space leap 			
Free space dist (m)	NA	5	7.5	10
EVM (%)	5	19	22	25

MILLIMETER-WAVE MODULES

Antenna

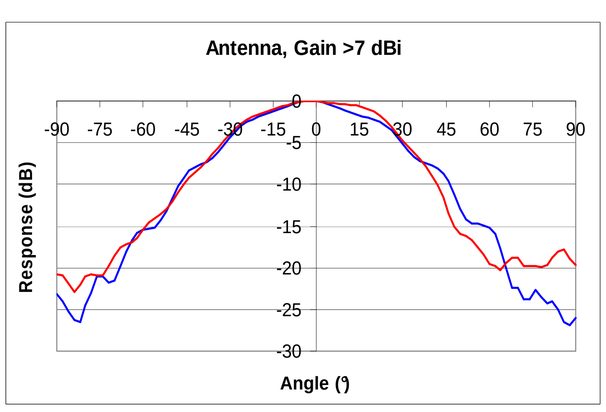
- Low cost foam technology
- >7 dBi Gain at 60 GHz
- Return loss > 20 dB from 57 to 65 GHz

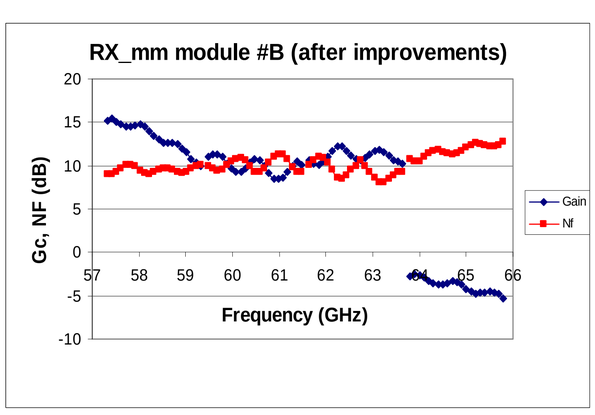
RX/TX modules

- Rogers 4003 substrate
- MMICs with chip-and-wire technology
- DC management
- Antenna interfaced by waveguide

Further work: 2nd and 3rd generation

- RX: Improve NF
- TX: Improve LO rejection
- Minimize modules
- Further integration between cm- and mm-wave parts





Contact camilla.karnfelt@telecom-bretagne.eu - http://www.telecom-bretagne.eu